

CLAIMS

What is claimed is:

1. A modulator arrangement configured for maskless lithography or printing applications, the modular arrangement comprising:

at least two array tiles of modulators, each array tile having a substantially equal modulator pitch and being configured to form a plurality of rows, each row extending in a first direction, and a plurality of columns, each column extending in a second direction,

wherein the first direction and the second direction are substantially perpendicular to each other, and

wherein two adjacent array tiles are separated by

a first displacement in the first direction and

a second displacement in the second direction.

2. The modulator arrangement of claim 1,

wherein each of the plurality of rows in each array tile includes a first number of modulators distributed in the first direction,

wherein each of the plurality of columns in each array tile includes a second number of modulators distributed in the second direction,

wherein the at least two array tiles are configured to move along a scan direction at an angle between the first direction and the second direction, and

wherein the scan direction is chosen to form a continuous lithographic swath having a swath width in the second direction.

3. The modulator arrangement of claim 2,

wherein the second displacement is equal to the first displacement divided by a product of a total number of array tiles and the first number of modulators.

4. The modulator arrangement of claim 2, further comprising one or more drivers coupled to each array tile.

5. The modulator arrangement of claim 4,

wherein the one or more drivers are configured around each array tile on no more than three sides.

6. The modulator arrangement of claim 5,

wherein each of the array tiles and the one or more drivers are located on a single integrated circuit die.

7. The modulator arrangement of claim 4, wherein the drivers are coupled to top and bottom sides of the array tiles, and wherein the array tiles abut each other on left and right sides.

8. The modulator arrangement of claim 7, wherein the arrangement includes more than two array tiles.

9. The modulator arrangement of claim 1,
wherein the first and second displacements are chosen such that the modulator arrangement is configured to write pixels onto a media having substantially complete two-dimensional swath coverage.

10. The modulator arrangement of claim 1,
wherein each modulator comprises a plurality of ribbon structures.

11. The modulator arrangement of claim 10,
wherein the plurality of ribbon structures includes a number of ribbons selected from a group consisting of from 3 to 15.

12. A writing points array apparatus configured for maskless lithography or printing applications, the apparatus comprising:

at least two sections, each section having a substantially equal writing point pitch and is configured to form a plurality of rows, each row extending in a first direction, and a plurality of columns, each column extending in a second direction,

wherein the first direction and the second direction are substantially perpendicular to each other, and

wherein two adjacent sections are separated by

a first displacement in the first direction and

a second displacement in the second direction.

13. The writing points array apparatus of claim 12,

wherein each of the plurality of rows includes a first number of writing points,

wherein each of the plurality of columns includes a second number of writing points,

wherein the at least two sections are configured to move along a scan direction between the first direction and the second direction, and

wherein the scan direction is chosen to form a continuous lithographic swath having a swath width in the second direction.

14. The writing points array apparatus of claim 13,

wherein the second displacement is equal to the first displacement divided by a product of a total number of sections and the first number of writing points.

15. The writing points array apparatus of claim 14,

wherein each of the writing points includes a lens.

16. The writing points array apparatus of claim 14,

wherein each of the writing points includes an electron beam generating device.

17. A method of forming a swath of closely-packed pixels on a surface for a maskless lithography or printing application, the method comprising:

moving an arrangement of modulator array tiles relative to the surface along a scan direction between a first direction and a second direction,

wherein each modulator array tile is configured to have a substantially equal modulator pitch and to form a plurality of rows, each row extending in a first

direction, and a plurality of columns, each column extending in a second direction,
and

wherein the first direction and the second direction are substantially
perpendicular to each other;

forming a first swath of closely-packed pixels with a swath width in the second
direction if the scan direction is closer to the first direction than the second direction;
and

forming a second swath of closely-packed pixels with a swath width in the first
direction if the scan direction is closer to the second direction than the first direction.

18. The method of claim 17, wherein the plurality of modulators per row on each
array tile are of a substantially different number than the plurality of modulators per
column.

19. The method of claim 16, further comprising:

driving the modulators of each array tile using driver circuits coupled to non-
abutting sides of each array tile, wherein the non-abutting sides do not abut another
array tile.

20. The method of claim 16, further comprising:

utilizing an intermediate array between the arrangement of modular array tiles and the surface to reduce an alignment accuracy requirement.